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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/985,822	11/06/2001	Eamon Brady	08157.0021	4538

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EXAMINER	
NAFF, DAVID M	

ART UNIT	PAPER NUMBER
1651	

DATE MAILED: 12/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/985,822	BRADY ET AL.	
	Examiner	Art Unit	
	David M. Naff	1651	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 September 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-108* is/are pending in the application.

4a) Of the above claim(s) *47-108* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-46* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *9/16/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

An amendment of 9/16/04 amended the specification, and claims 1, 3, 7, 8-17, 20-27, 31, 33, 36, 39, 41, 44 and 46.

Claims 47-108 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 3/23/04.

Claims examined on the merits are 1-46.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 112

Claims 16-26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 16, the meaning and scope of "solubility parameter" is uncertain. This term has not been defined in the specification, and the specification fails to describe measurements and calculations that must be carried out to determine the solubility parameter for a particular substance.

The term "cohesive energy density" in claim 23 is uncertain as to meaning and scope, and it is uncertain as to measurements and calculations needed to determine cohesive energy density. Additionally, it is uncertain how "MPa" can represent both "solubility parameter" and "cohesive energy density".

In claims 17 and 23, requiring a soft phase and a hard phase is confusing. Since the scaffold comprises the cellular material, it appears the cellular material is a solid since the scaffold is a solid, and it is not seen how a scaffold in solid form can contain a soft phase and a hard phase as separate phases. It appears soft and hard phases exist only in a process of making the scaffold as disclosed in the specification (pages 47-50) where a polyol resin which is a soft phase is mixed with an isocyanate resin which is a hard phase. After mixing and reaction of the resins, there are no longer separate and distinct phases which can be labeled as soft and hard. See the specification at page 49, lines 15-18, where it is disclosed that two incompatible phases are interspersed to bring reactive sites into close proximity to facilitate reactions. The reaction appears to be between the polyol preparation (page 48) and the isocyanate preparation (page 47). After mixing and reacting and curing (page 51, lines 1-8)) which allows all reactive sites to react, it is not seen how the resulting polymer can contain two distinct and separate phases with one hard and the other soft.

In claims 18 and 19, "polar ratio" is uncertain as to meaning and scope. Claim 18 should contain the definition of the term as in the specification (paragraph bridging pages 23 and 24) by before the period in line 2, inserting --- , wherein the polar ratio is the ratio of carbon atoms to the sum of nitrogen and oxygen atoms contained by the polyurethane polymer ---. With this change , line 2 of claim 1 should be amended by inserting --- polymer --- after "polyurethane".

Clear antecedent basis is not found for "the polymer" in line 1 of claims 18 and 19. The insertion of polymer in line 2 of claim 1 as set forth above will provide antecedent basis.

In claims 24-26, "leachables" is uncertain as meaning and scope. Materials that are leachables and not leachables is uncertain. Whether a material is a leachable will depend on its function in a process for preparing the scaffold, and the present claims are claiming a scaffold instead of a process.

Response to Arguments

While amendments and arguments have overcome some of the indefiniteness, claims are still indefinite for reasons set forth above.

Applicants urge that "solubility parameter" and "cohesive energy density" are well known in the art and are not indefinite. However, a review of the prior art shows that solubility parameter is expressed as "Hansen's solubility parameter" or "Hildebrand solubility parameter", and it is uncertain as which solubility parameter the claims require. While the term "cohesive energy density" is known in the art, no art is apparent expressing cohesive energy density as $MPa^{1/2}$. It is not seen how both solubility parameter and cohesive energy density can both be expressed in terms of MPa.

Requiring a hard phase and soft phase is still indefinite with the amendment to claim 17 since these phases only exist in a process of preparing the scaffold and are not in the scaffold. Reciting "formation of the material" in claim 17 does not set forth a process

so that it is clear how the phases function in defining the scaffold obtained.

While "polar ratio" is defined in the specification as urged by applicants, the polar ratio is determined by groups contained by the polymer. Without knowing the groups used to determine the polar ratio, it would be uncertain as to polar ratio claimed. The groups disclosed in the specification for determining polar ration would not have to be used in determining the claimed polar ratio. It is suggested that the claims require the polar ratio to be the ratio of carbon atoms to the sum of nitrogen and oxygen atoms contained by the polymer as defined in the specification.

In regard to reciting "polymer" in claims 18 and 19, applicants assert this is implicit in the recital of "polyurethane" in claim 1. However, while this might be implicit, it would not have to be implicit, and without "polymer" being recited in claim 1, one would not know whether the polymer of claims 18 and 19 is the polyurethane or some other polymer. It is suggested that "polyurethane material" in claim 1 be changed to --- polyurethane polymer ---.

Reciting "a leachables content" in claim 24 does not make leachables definite in claims 24-26 since leachables are used in a process of preparing the scaffold, and without knowing the process carried out, one would not be certain as to materials that will be leachables in the claims.

Claim Rejections - 35 USC § 103

Claims 1-26 and 39-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brady et al (6,177,522 B1) in view of Holy et al (6,379,962 B1), and if necessary in further view of Agrawal et al (6,187,329 B1) or Brekke (4,186,448) or Barrows et al (5,856,367) for reasons in the previous office action of 6/16/04, and for reasons herein.

The claims are drawn to a tissue engineering scaffold comprising a porous polyurethane cellular material having a plurality of voids interconnected by pores, wherein the cellular material has a void content of 85 to 98% and a surface area to volume ratio of from 5 to 400 mm^2/mm^3.

Brady et al disclose preparing porous polycarbonate urethane polymer such as a polyurethane foam for implanting in the body (col 1, lines 6-11). The polycarbonate urethane is based on diol, diamine, water and chain extenders (col 8, lines 12-15). Foams of lowest density are prepared by a combination of water blown reaction, in a depressurized reactive/forming vessel with the incorporation of a physical blowing agent into the formulation (paragraph bridging cols 8 and 9). A quasiprepolymer system can be used where some of the polyol is reacted with the isocyanate to generate an isocyanate terminated prepolymer in an excess of isocyanate, and remaining polyol and chain extender is subsequently added (col 9, lines 22-26). The isocyanate can be diphenylmethane diisocyanate (col 5, line 29), and a chain extender can be 1,4 butanediol (col 10, line 57). Carbon dioxide

generated as a byproduct forms a cellular structure, and with the use of a surfactant the size and porosity of the cellular structure can be controlled (col 8, lines 40-46). The void space can be at least 80% (col 10, lines 40-43). Density can be controlled independently of the hard segment content by controlling the pressure of the reaction/forming chamber (col 8, lines 50-52).

Holy et al disclose a polymer scaffold having a macroporous network with macropores having microporous struts as walls. The porosity is greater than 85% (col 6, line 61).

Agrawal et al disclose a polymer matrix for implanting having a porosity of 1-99% and particularly 75-99% (col 14 lines 15-20).

Brekke discloses a polymer material for implanting having about 90% voids (col 1, line 44 and paragraph bridging cols 1 and 2).

Barrows et al disclose a porous matrix for implanting having a void volume of 20-97% (col 14, lines 40-42).

When preparing the polyurethane polymer material having a cellular structure as disclosed by Brady et al, it would have been obvious to provide the cellular structure with a porosity of greater than 85% as disclosed by Holy et al, and if necessary as further suggested by Agrawal et al, Brekke or Barrows et al disclosing polymer implants having a porosity or void volume that can be higher than 85% since Brady et al disclose a void space of at least 80% (col 10, line 43) and producing foams of lowest density (col 8, lines 65-67) that inherently have a high void volume as claimed. The cellular structure in the form of a foam of Brady et al when having a void content as set

forth above will inherently contain a plurality of voids interconnected by pores, and a surface area to volume ratio as claimed. The limitations of dependent claims are inherent in Brady et al, or would have been obvious from Brady et al in combination with the other references.

Response to Arguments

Applicants urge that Brady et al does not disclose a void content of 85-98%, a surface area of 5-400 mm^2/mm^3, and regularly shaped close packed and interpenetrating voids and a plurality of pores that interconnect the voids. However, due to the similarity of the process of Brady et al to that disclosed in the present specification, it appears the polymer foam of Brady et al is inherently the same as presently claimed porous polymer, except it may not have the percent void content claimed. Since Brady et al disclose at least 80% void space, it would have been obvious to provide greater than 85% void content as suggested by Holy et al, and if needed Agrawal et al or Brekke or Barrows et al.

While Holy et al, Agrawal et al, Brekke and Barrows et al may not disclose the precise same polymer as Brady et al, the polymers of these references, like the polymer of Brady et al, are porous, and there are seen nothing in differences from the polymer of Brady et al that would lead one to believe the polymer of Brady et al cannot have a void space of at least 85%. Holy et al and Agrawal et al, Brekke or Barrows et al are not relied on for structure of the claimed polymer, except for the claimed percent void content, since the structure of

the Brady et al polymer is inherently the same as presently claimed except that it may not have the claimed percent void content. Due to the similarity of the process of Brady et al to that described in the present specification, the polymer of Brady et al will inherently have a surface area to volume ratio of 5 to 400 mm^2/mm^3, and there is inadequate evidence to support the contrary. If applicants persist that the ratio is different, it is suggested they point out how the process for producing the claimed scaffold is different from the process described by Brady et al to result in a different ratio.

Claim Rejections - 35 USC § 103

Claims 27, 28, 31-36 and 39-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claims 1-26 and 39-46 above, and further in view of Hanson (4,687,482) and Tabor (5,478,867) for reasons in the previous office action and for reasons herein.

The claims require manufacturing the scaffold using diphenyl methane diisocyanate containing less than 3% 2,4 isomer, a linear long chain diol which is free of tertiary carbon linkages, water, a cross-linking agent, a trimerisation catalyst, a blowing and/or gelling catalyst and a surfactant.

Hanson disclose making a polyurethane polymer for implanting using polytetramethylene ether glycol (col 6, line 53).

Tabor discloses using a trimerization catalyst in preparing a porous polyurethane foam polymer to lower density and compressive

strength of the foam (col 6, lines 31-49). The catalyst can be potassium acetate (col 6, line 46).

When preparing the polyurethane foam of Brady et al as set forth above, it would have been obvious to use polytetramethylene ether glycol as the diol as suggested by Hanson and a trimerization catalyst as suggested by Tabor. Using diphenyl methane diisocyanate containing less than 3% 2,4 isomer would have been obvious to us a pure diphenyl methane diisocyanate.

Response to Arguments

Applicants urge that the references applied in the present rejection do not overcome the deficiencies of the references applied above. However, for reasons set forth above, the references applied are not deficient.

Claim Rejections - 35 USC § 103

Claims 27, 29-36 and 39-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claims 1-26 and 39-46 above, and further in view of Reich et al (5,993,972) and Tabor for reasons in the previous office action and for reasons herein.

Claims 29 and 30 require the diol of claim 27 to be a polycarbonate diol.

The invention of claim 27 and Tabor are described above.

Reich et al disclose using a polycarbonate diol (for example see col 6, line 13) in preparing a polyurethane polymer that can be implanted (col 5, line 42).

When preparing the polyurethane foam of Brady et al as set forth above, it would have been obvious to use a polycarbonate diol as the diol as suggested by Reich et al and a trimerization catalyst as suggested by Tabor. Using diphenyl methane diisocyanate containing less than 3% 2,4 isomer would have been obvious to us a pure diphenyl methane diisocyanate.

Response to Arguments

The response set forth above in regard to arguments traversing the rejection of claims 27, 28, 31-36 and 39-46 also applies to this rejection.

Claim Rejections - 35 USC § 103

Claims 37 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claims 27, 28, 31-36 and 39-46 or claims 27, 28, 31-36 and 39-46 above, and further in view of Jamiolkowski et al (6,147,168) for reasons in the previous office action and for reasons herein.

The claims require a trialkanol amine cross-linking agent.

Jamiolkowski et al disclose using triethanolamine (col 11, line 49) when carrying out polymerization in preparing a polyurethane polymer that can be used as an implant.

When preparing the polyurethane foam of Brady et al as set forth above, it would have been obvious to use triethanolamine as a cross-linking agent as suggested by Jamiolkowski et al.

Response to Arguments

The response set forth above in regard to arguments traversing the rejection of claims 27, 28, 31-36 and 39-46 also applies to this rejection.

Double Patenting

Claims 1-26 and 39-46 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-14 of U.S. Patent No. 6,177,522 in view of Holy et al, and if necessary in further view of Agrawal et al or Brekke or Barrows et al.

Claims of the patent are drawn to a polycarbonate urethane article that can be a foam prepared by reacting a polycarbonate polyol, an isocyanate, water and a chain extender.

For the type of reasons set forth above, it would have been obvious to provide the foam of the patent claims with a porosity of greater than 85% as disclosed by Holy et al, and if necessary as further suggested by Agrawal et al, Brekke or Barrows et al disclosing polymer implants having a porosity or void volume that can be higher than 85% and since claim 8 requires a void space of at least 80%. A foam of the patent claims when having a porosity or void space as set forth above will inherently have a plurality of voids interconnected by pores and a surface area to volume ratio as claimed.

The conditions of dependent claims will be obvious in view of the claims of the patent and Holy et al, and if necessary in further view of Agrawal et al, Brekke or Barrows et al.

Double Patenting

Claims 27, 28, 31-36 and 39-46 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-14 of U.S. Patent No. 6,177,522 in view of Holy et al, and if necessary in further view of Agrawal et al or Brekke or Barrows et al as set forth above under obvious double patenting, and further in view of Hanson and Tabor for the type of reasons above when applying these references.

When preparing the urethane foam of the claims of the patent as set forth above, it would have been obvious to use polytetramethylene ether glycol as the diol as suggested by Hanson and a trimerization catalyst as suggested by Tabor. Using diphenyl methane diisocyanate containing less than 3% 2,4 isomer would have been obvious to us a pure diphenyl methane diisocyanate.

Double Patenting

Claims 27, 29-36 and 39-46 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-14 of U.S. Patent No. 6,177,522 in view of Holy et al, and if necessary in further view of Agrawal et al or Brekke or Barrows et al as set forth above under obvious double patenting, and further in view of Reich et al and Tabor for the type of reasons above when applying these references.

When preparing the urethane foam of the claims of the patent as set forth above, it would have been obvious to use a polycarbonate diol as the diol of the patent claims as suggested by Reich et al and

a trimerization catalyst as suggested by Tabor. Using diphenyl methane diisocyanate containing less than 3% 2,4 isomer would have been obvious to us a pure diphenyl methane diisocyanate.

Double Patenting

Claims 37 and 38 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-14 of U.S. Patent No. 6,177,522 in view of references as applied to claims 27, 28, 31-36 and 39-46 or claims 27, 28, 31-36 and 39-46 above under obvious double patenting, and further in view of Jamiolkowski et al for the type of reasons above when applying this reference.

When preparing the urethane foam of the patent claims as set forth above, it would have been obvious to use triethanolamine as a cross-linking agent as suggested by Jamiolkowski et al.

Response to Arguments

Applicants state that a terminal disclaimer will be submitted to overcome the double patenting rejections when allowable subject matter is indicated.

When a proper terminal disclaimer is received, the obvious double patenting rejections over Patent No. 6,177,522 will be withdrawn.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

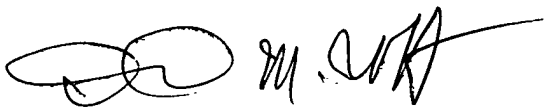
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In

the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David M. Naff whose telephone number is 571-272-0920. The examiner can normally be reached on Monday-Friday 9:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mike Wityshyn can be reached on 571-272-0926. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



David M. Naff
Primary Examiner
Art Unit 1651

DMN
12/16/04